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Nuclear Safety and Nuclear Sovereign Rights with the Context of Republic of Korea-United States (ROK-US) Partnership

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Abstract

South Korea has been the world's sixth-largest producer of nuclear energy, with twenty nuclear power reactors supplying about 40% of a country's electricity. The Republic of Korea-United States (ROK-US) partnership has enabled South Korea's nuclear power growth. In 1972, the Atomic Energy Treaty was signed under the provisions of the agreement, the United States supplied nuclear technology and materials required for the development of nuclear energy; in exchange, South Korea was explicitly banned from proliferation-related operations such as used fuel reprocessing as well as uranium refinement. The two countries are expected to extend their nuclear cooperation agreement by 2014, amid three decades of fruitful collaboration. Negotiations among Seoul and Washington on a new agreement, on the other hand, may be a source of friction and disagreement. South Korea's desire for a full fuel-cycle capability, in particular, may directly clash with President Obama's demand for a world free of nuclear arms and United States (US) worries about nuclear weaponry. The bilateral talks between the US and the Republic of Korea will have significant consequences for the worldwide non-proliferation system as well as security in the region. The problems and challenges of renewing the ROK-US relationship are discussed in this article. The agreement on atomic energy is discussed, as well as the policy implications for the ROK-US relationship.

Keywords: Nuclear energy; Nuclear fuel; Nuclear sovereignty; Nuclear waste; Nuclear weapons

Introduction

The Republic of Korea (ROK) built its first operational nuclear power plant around 1970; nuclear power has grown in importance in the context of energy. South Korea purchases 97 % of its energy needs due to its energy scarcity. South Korea is now the globe's sixth-largest atomic energy producer, having 20 nuclear power reactors supplying about 40% of the country's electricity. The ROK-US Atomic Energy Agreement, agreed in 1972, paved the way for South Korea's nuclear energy growth. The United States supplied nuclear materials and technology for the sustainable usage of nuclear energy under this agreement. South Korea was expressly forbidden from participating in proliferation-related operations like as spent fuel reprocessing and uranium enrichment [1].

The ROK-US governments are expected to extend the deal after three decades of effective bilateral nuclear cooperation; nevertheless, talks for a fresh pact between Seoul as well as Washington may possibly become a point of tension and disagreement. South Korea's desire for a full fuel-cycle capability, in particular, may run counter to President Obama's demand for a world free of nuclear weapons and United States worries about proliferation. The bilateral talks between the United States and the Republic of Korea will have significant implications for global non-proliferation as well as local security in Asia. The problems and obstacles for the extension of the ROK-US Atomic Energy Agreement are discussed in this paper, as well as the policy recommendations for the ROK-US association.

Literature Review

The Republic of Korea's Nuclear Potential and Requirement

South Korea's energy consumption has skyrocketed in recent decades as the country's economy has expanded quickly. Since 1980, the South Korean economy has grown at an average yearly pace of 8.6% each year. Since 1990, South Korea's power consumption has grown at a rate of more than 9% per year. Between 1980 and 2006, the country's energy usage increased by more than tenfold, between 33 billion to 371 billion kWh. South Korea, on the other hand, imports 97 % of its power [2]. Figure 1 shows the projected nuclear weapons arsenal for North Korea.

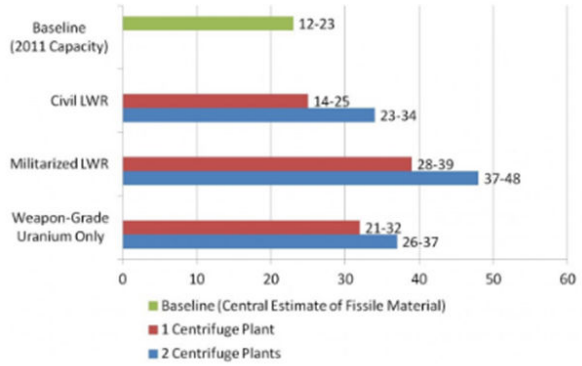

Figure 1: Illustrates the projected nuclear weapons arsenal for North Korea. These projections show an increase in North Korea's nuclear weapons arsenal.

Nuclear energy is by far the most cost-effective way to generate electricity. Nuclear power production costs 39 won every kWh

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(approximately 3 US cents), as per the Korea Nuclear and Hydro Power Co. (KNHP), compared to the cost of producing the same amount of electrical energy using coal (53.7 won), and hydro (162 won). Nuclear energy has appeared as a significant alternative energy source for the nation's ever-growing energy needs, due to increasing fossil fuel costs.

As a consequence, South Korea's energy generation has grown more reliant on nuclear power. South Korea presently has 21 power stations in operation, which supply over 40% of the country's energy, with six more under development. South Korea's nuclear sector may grow to be one of the top five in the world by 2035, producing up to 60% of the country's energy, according to the Ministry of Education, Science, and Technology. By 2030, the government intends to be have 38 nuclear energy facilities. In 2009, the Korea Hydro and Nuclear Power (KHNP) invested 4.7 trillion won ($3.68 billion) on new nuclear power reactors. By 2030, it intends to invest 40-50 trillion won ($32-40 billion) on the construction of 18 new nuclear power reactors [3].

Nuclear energy is regarded as a crucial component of South Korea's ambitious new economic strategy under President Lee Myung-Green bak's Growth initiative to cope with the actuality of declining labor productivity while satisfying the challenge of resource depletion and climate change in the twenty-first century. “Nuclear power is among the most efficient power production techniques that will bring us to a low-carbon world, and researchers want to ensure that Korea maintains its position as a key provider of such zero-carbon power plants”, Lee said. As South Korea's nuclear technology advance, Seoul has intensified its attempts to convince Washington to allow it to pursue a larger atomic programme [4].

Seoul has indicated a strong desire to revise the 1973 nuclear agreement's limitations so that it may seek complete nuclear fuel cycle capability. In June 2009, the Chairman of the ruling Grand National Party's (GNP) National Policy Committee stated that South Korea must not give up its "peaceful nuclear sovereignty" in talks with the US. Later, the Minister of Knowledge Economy, who is also in charge of nuclear energy, voiced similar sentiments about the agreement's impending modification. To meet the 2014 modification date, which would need arduous Congressional approval, the two governments began exploratory talks in the autumn of 2009 and had their first formal negotiations in Washington, D.C. a year later in 2010. Figure 2 shows total number of nuclear warheads by country since 2019.

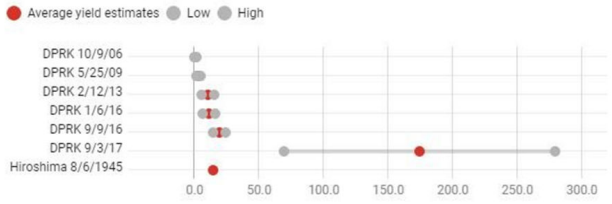

Figure 2: Illustrates the number of nuclear warheads by country since 2019. More than 90% of the globe's nuclear warheads are held by Russia and the United States, and the recent decrease in the worldwide inventory may be ascribed to the retirement as well as abolishment of weapons across both nations (STATISTA).

Allies with conflicting objectives

The increasing energy demand as well as business interests of South Korea are driving its desire to revise the agreement. The Korean government emphasizes that its desire for a more thorough fuel cycle capacity stems from its desire to use nuclear energy for peaceful purposes. South Korea, on the other hand, believes it has a legal right to advanced nuclear technology because of its commitment to non-proliferation and increasing nuclear power generation ability. With the propagation of nuclear weapons and terrorism, nuclear proliferation becomes a serious worry for the United States government. Through its focus on terrorism attacks and its nuclear weapons-free world initiative, the Obama administration prioritized non-proliferation among its top foreign policy priorities. The adoption of innovative fuel cycle capacity in South Korea would put the US in a bind between handling its alliance collaboration and global nuclear safety efforts [5].

Chairman Kim Jong Un, North Korea's leader, is obviously not in a rush to demilitarize his nation. Kim paid a state visit to Moscow in April after two historic but ineffective meetings with President Trump, during which he made it plain that his country would not negotiate up its nuclear arsenal without international security assurances. On April 18, North Korea launched what looked to be short-range missiles. Figure 3 shows projected explosion yield for North Korean nuclear tests.

Figure 3: Projected explosion yield for North Korean nuclear tests. On April 18, North Korea launched what looked to be short-range missiles [PHYS].

Nuclear sovereignty in peace

Seoul's economic interest in a complete nuclear fuel cycle capacity is fuelled by many factors: To begin with, South Korea claims that a reprocessing capacity is required to handle the fast growing inventory of nuclear waste. By 2008, South Korea had generated 10,083 tons of spent fuel after years of ambitious nuclear energy programs. By 2040, the stockpile is projected to be 42,000 tons, and by 2100, it will be 100,000 tons. The government has a significant problem in handling the growing amount of nuclear waste due to South Korea's limited area and strong public opposition to nuclear waste [6].

South Korea has been storing spent fuel indefinitely at three nuclear sites until recently. However, owing to space constraints, this would no longer be an option. As per the KHNP, the three sites' current capacity will be reached in 2016. The current on-site disposal of spent fuel will be put under further strain as the usage of atomic energy grows. Furthermore, little progress has been made in locating a location for consolidated spent fuel storage. Without reprocessing, the 100,000 tons of spent nuclear fuel buried 500 meters (approximately 1,640 feet) deep in rock caves would require a minimum disposal vault size of 20 square kilometers (7.7 square miles). It would be very

rare to find such open space in South Korea, a nation the size of Virginia with a populace of about 50 million people [7].

For most nuclear-power-generating nations, handling nuclear waste seems to have become a significant issue. For example, in 2009, the US government was forced to abandon plans to construct a nuclear waste site in Nevada's Yucca Mountain capable of holding 70,000 metric tons of radioactive waste. Despite its isolated location and geologically secure location, the site continues to be a source of contention for environmental activists, communities, the United States Congress, and governmental departments. Decades of geological study and testing, backed by $9 billion in government money, were not enough to assuage local people' fears about nuclear safety. The South Korean administration had to learn the hard way how tough it is to locate such space. After a succession of tense talks including public protests and local ballot initiatives, the government promised to pay the town of Gyeongju at minimum $1.5 billion to secure a two-square-kilometer location for low-level trash in 2005. It would be virtually difficult to find a location ten to forty times larger, particularly for a higher-level waste. Reprocessing is one option for decreasing the amount of trash. According to an industry expert, reprocessing KHNP spent fuel would require 20 to 50 percent fewer disposal area than high-level waste [8].

Second, there is a rising commercial interest in the area. South Korea hopes to benefit itself from nuclear capability by tapping into the world's expanding nuclear energy industry after 3 decades of nuclear power development. After completing a $20 billion nuclear power project deal with the United Arab Emirates (UAE) in December 2009, South Korean President Lee got a hero's welcome in Seoul. A South Korean consortium headed by the Korea Electric Power Corporation (KEPCO) would construct four commercial nuclear reactors in the UAE by 2020 under the terms of the deal.

South Korea has turned into a significant new provider in the worldwide nuclear energy industry, according to the news. Many people were surprised since the South Korean business got the deal despite stiff competition from two big global nuclear energy providers, Areva of France as well as a General Electric-Hitachi partnership. “South Korea has accomplished the shift from passive buyer of turn-key nuclear facilities in the 1970s to significant nuclear technology provider, capable of contending with the world's biggest and most sophisticated nuclear technology companies”, according to a report to the United States Congress. Thailand, Vietnam, South Korea has also committed to supply a small nuclear facility to Jordan and hopes to engage in additional nuclear projects in Thailand, Vietnam, Indonesia, the Philippines, Poland, Kazakhstan, India, and Morocco, in addition to such UAE deal [9].

The agreement with the UAE exemplified South Korea's ambition to become a significant player in the rapidly growing worldwide nuclear power plant industry. “Nuclear power-related industry will be the most lucrative market after cars, electronics, and shipbuilding”, stated then-South Korean Minister of Knowledge Economy Choi Kyung-hwan in a report to the President, adding, “We will push the sector as a key export industry”. For the next 20 years, it sets a target of collecting 20% of new orders [10].

This implies that out of approximately 400 commercial reactors expected to be purchased worldwide until 2030, South Korea intends to exporting 80 reactors costing $400 billion. South Korea, on the other hand, is lacking in critical nuclear technical capabilities like as enriching uranium and spent fuel recycling. South Korea aspires to have the same technical capabilities as French and Japanese firms who have a complete nuclear fuel cycle capability. Meanwhile, South Korea buys more than $300 million value of enriched fuel grade uranium from Russia, Canada, and the United States for its 20 nuclear power reactors. South Korea is expected to have adequate need for a domestic enrichment facility after it has built 30 or even more nuclear power reactors in the near future, according to industry analysts. South Korea's status as a nuclear power provider will be bolstered by its uranium enrichment capabilities [11].

Third, as a long-term answer to its energy needs, South Korea grew interested in reprocessing. To satisfy its rising energy demand, South Korea must develop nuclear energy. South Korea imports approximately $90 billion value of energy each year. Nuclear energy is seen as a viable option to cope with fast growing energy prices and rising carbon emissions. Natural uranium, on the other hand, has increased in price from $20 per kilogram to $140 in the last decade. In terms of long-term economic efficiency, this makes the possibility of reprocessing spent uranium more appealing.

South Korean uranium shipments would be reduced by approximately one-third if uranium from spent fuel could be recycled. Every year, South Korea imports approximately 3,800 tonnes of uranium. The issue is that reprocessing nuclear waste under present technology is extremely costly owing to technological challenges and safety considerations, and only a few nations, like France and Russia, operate commercial reprocessing plants [12].

The nuclear scientific community has been working on next-generation nuclear technologies for a long time, with the goal of significantly improving the economic effectiveness of reprocessing in terms of power production and waste management. Major nuclear powers, like France, Germany, Russia, as well as Japan, have been working on next-generation reactor as well as waste-recycling technologies that will enable reprocessing more cost-effective and produce less dangerous nuclear waste. South Korea aspires to become a leader in next-generation nuclear power production as its energy consumption and atomic capacity increase.

Pyro processing and a rapid breeder reactor are being done by researchers at the Korea Atomic Energy Research Institute (KAERI), a government-funded nuclear research facility in Daejeon. The effort entails performing research-level spent fuel reprocessing, which is absolutely banned under South Korea's existing atomic deal with the US. The 1987 amendment of the US-Japan Atomic Energy Treaty granted Japan a comprehensive commitment to build complete nuclear fuel cycle capability. Given its position as a significant atomic power and a key US ally like Japan, South Korea seeks the same recognition from the US. “We will make the deal reflect the substance that optimizes the peaceful and economic applications of nuclear power,” then-South Korean Foreign Minister Yu Myung-hwan said in a National Assembly hearing. Yu said that South Korea is willing to discuss on the agreement's modification, particularly the problem of used nuclear fuel dry processing (pyro processing) [13].

Nuclear non-proliferation in the United States

The United States is indeed the world's biggest nuclear power generator, producing more than 30% of the world's nuclear electricity. The country's 104 nuclear reactors generate approximately 20% of the country's total energy. Since 1977, no one nuclear power plant has been authorized. For more than 30 years, new development has been put on hold because to increased security concerns, particularly

following the 1979 Three Mile Island disaster. Environmental groups, civic organizations, as well as skeptics in the United States Congress have all been vocal in their opposition to the construction of a new nuclear power station. Meanwhile, the US has stepped up its non-proliferation measures in its nuclear energy collaboration with other nations.

In 1978, Congress enacted the Nuclear Non-Proliferation Act (NNPA), which required the US government to seek more stringent restrictions on nuclear material and technology from its allies. Since then, all new pacific nuclear cooperation agreements involving 20 nations have included stringent non-proliferation restrictions on nuclear equipment and materials made in the United States, as well as tight limitations for any reprocessing or enrichment requiring U.S. approval.

Those restrictions were much more stringent than those in the current ROK-US agreement, which was inked in 1973. The existing contract with South Korea only allows the United States to consent to the reprocessing of nuclear fuel produced in the United States. However, in addition to nuclear fuel explicitly imported from the United States, the new agreement would need U.S. permission for the remanufacturing of any nuclear fuel treated in U.S. origin nuclear reactors. It also requires US approval for fuel enrichment, which was not included in the previous deal. “U.S. negotiators would certainly push for incorporating all NNPA-specified conditions” in the 2014 agreement modification [14]. Indeed, nuclear non-proliferation is one of the Obama administration's top foreign policy priorities. In contrast to the Bush administration, the Obama administration appears to be less passionate about the peaceful uses energy. The Bush administration pushed for the construction of next-generation nuclear reactors as part of the Global Nuclear Energy Partnership (GNEP) programme, which aimed to make nuclear energy more environmentally benign and efficient. It promoted worldwide cooperation in the development of new technologies and the security of nuclear energy supplies. During the Bush administration, South Korea worked well with Idaho National Research Laboratory (INL) in pyro processing on a research and development effort for next-generation nuclear power reactors.

President Obama, on the other hand, has concentrated on non-proliferation from the start, since he was worried about the threat of nuclear terrorism. In his maiden appearance before the UN General Assembly in September 2009, he urged for a pledge by the international community to a future free of nuclear weapons after announcing his vision of a world free of nuclear weapons in Poland in May 2009. President Barack Obama hosted a Nuclear Security Summit in Washington, D.C. in April 2010, bringing together officials from 47 nations, including all major nuclear powers. Avoiding nuclear terrorism and regulating the transfer of nuclear materials were high on the agenda once again. Sustainable nuclear energy was listed as the 12th step for strengthening nuclear security in a joint statement issued after the summit. Given President Obama's pledge to safeguard sensitive nuclear materials as well as strengthen non-proliferation efforts like the Nuclear Non-proliferation Treaty and the International Atomic Energy Agency, it's highly improbable that the Obama regime will be enthused about South Korea's demand for a thorough agreement that allows Seoul to engage in reprocessing. Indeed, Ellen Tauscher, a senior administration official, voiced grave concerns about the proposal. Tauscher, the Under Secretary of State for Arms Control and International Security, said during her confirmation hearing that granting South Korea permission to reprocessing would not be necessarily suitable [15].

Discussion

The emergence of South Korea as a new competitor for a piece of the lucrative worldwide nuclear energy market has opened up some new possibilities for ROK-US nuclear cooperation. The US would insist that South Korea guarantee non-proliferation in nuclear plant exports to third parties. This may open up additional possibilities for collaboration between Seoul and Washington in nuclear non-proliferation and nuclear energy. South Korea wants to develop a much more self-sufficient nuclear capacity in order to meet its ambitious target of exporting 80 reactors by 2030. South Korea aspires to be free of intellectual property restrictions imposed by its initial licensor, the United States. Meanwhile, South Korea may be a suitable partner for the United States' utmost relevance in nuclear energy as a low-cost, environmentally benign energy source. President Barack Obama announced a proposal in February 2010 to provide loan guarantees for the building and maintenance of two new nuclear power plants, the first on American soil in 30 years. If the Obama administration decides to adopt a more active nuclear energy strategy as a means of combating climate change while also reducing its reliance on foreign gas and oil, South Korea might be a suitable commercial partner.

Bids for commercial nuclear power facilities in the United States may include South Korean firms. Meanwhile, American firms may establish alliances with South Korean firms. The KEPCO partnership just signed a deal with the UAE, and Westinghouse, a U.S. firm, anticipates its portion of the agreement to be reportedly worth to $1 billion, or approximately 5% of the overall $20 billion, which would create or maintain thousands of U.S. employment. South Korea must make it very clear that its nuclear capability is benign and only for economic reasons in order to achieve an advanced nuclear deal with the US. The Atomic Agreement between the United States and Japan is based on Japan's long-standing commitment towards the peaceful usage of nuclear energy. Through its non-nuclear ideals of non-production, as well as non-introduction of atomic warheads as the first and last victims of nuclear arms, Japan has positioned itself as a prominent supporter of the anti-nuclear weapons campaign. In terms of its nuclear energy programme, South Korea should be extremely careful not to send a confused signal to the United States as well as the rest of the world.

Arguments for "nuclear sovereignty" cantered on popular nationalist feeling would be a terrible error. According to a recent survey, 69% of Koreans favour South Korea developing its own nuclear programme to oppose North Korea's nuclear programme. Both the South Korean government and the media must be wary of instilling unfounded fears about Seoul's nuclear ambitions. The successful holding of the 2012 nuclear summit in Seoul will significantly strengthen South Korea's commitment to non-proliferation and the peaceful usage nuclear energy in this regard.

Conclusion

A successful completion of a new ROK-US Atomic Energy Treaty may establish a paradigm for balancing advanced nuclear power ambitions with global challenges about the proliferation dangers of reprocessing. Renewal of the ROK-US Atomic Energy Treaty poses significant difficulties for the two nations. First, the continuing

disagreements over North Korea's nuclear weapons development raise basic questions about the wisdom of enabling South Korea to complete the whole fuel cycle. Second, unlike in the late 1980s, when the President Reagan supported Japan's eagerness for a full nuclear fuel cycle, the existing administration appears to be less enthusiastic about, if not outright opposed to, reprocessing collaboration with South Korea, as U.S Presidency nuclear-free world initiative emphasizes non-proliferation.

The Lee administration's focus on the ROK-US Alliance as a major pillar of foreign policy, this problem has been carefully avoided becoming another test case for the partnership both domestically and globally. Nonetheless, the Lee government sees nuclear energy as a critical component of South Korea's long-term development plan. It has established a strong desire to be able to complete the whole nuclear fuel cycle. Meanwhile, Washington must be cautious not to turn this problem into yet another test case for the alliance, which the competent authorities have pledged to elevate to a "strategic partnership" to face 21st century challenges. Seoul's genuine worries about its increasing nuclear waste management issue, as well as its fully matured nuclear capability, should be acknowledged by both the Executive Office as well as the Congress. Despite the challenges it has in negotiating with North Korea, it should explore the possibility of forming a long-term nuclear cooperation with Seoul. They must form a new alliance to lead the new nuclear energy frontier, which is peaceful, safe and affordable.

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